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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

MM91/0223

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ART UNIT

PAPER NUMBER

2811

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BABAJ S. SANI  
TOWNSEND AND TOWNSEND AND CREW  
TWO EMBARCADERO CENTER 8TH FLOOR  
SAN FRANCISCO CA 94111-3834

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.

09/282,274

Applicant(s)

Mo

Examiner

Shouxiang Hu

Group Art Unit

2811



☒ Responsive to communication(s) filed on Dec 14, 2000

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

## Disposition of Claim

☒ Claim(s) 1-10 is/are pending in the applicat

Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration

☐ Claim(s) \_\_\_\_\_ is/are allowed.

☒ Claim(s) 1-10 is/are rejected.

☐ Claim(s) \_\_\_\_\_ is/are objected to.

☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

☒ The proposed drawing correction, filed on Feb 14, 2000 is ☒ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some\* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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## DETAILED ACTION

### *Drawings*

1. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 12/4/2000, have been approved.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Harada (5,298,780).

Harada discloses a trench transistor (Fig.16), comprising: a substrate (2); a gate (4) in a trench and recessed from the substrate surface; a self-aligned source region (5), wherein the source region overlaps a portion of the gate structure and forms a p-n junction being essentially parallel to the sidewall of the trench.

Regarding claim 3, it is noted that the overlap between the source region and the gate structure inherently results in a gate-to-source capacitance.

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***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5- 7, 9 and 10 are rejected under 35 U.S.C. 103(a) as being obvious over Harada (5,298,780) in view of Applicant's admitted prior art (Fig. 1).

The disclosure of Harada is discussed as applied to claims 1-4 and 8 above.

Regarding claims 5-7, although Harada does not expressly disclose that the device can further comprise a source contact region, it is noted that it is well known in the art that it is normally desirable to have a source contact regions extended at the surface for lowering the contact resistance between the source electrode and the source region, as evidenced in Applicant's admitted prior art (Fig. 1), which comprises a thin source contact region extended at the substrate surface.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to incorporate a thin surface source contact region into the trench transistor of Harada, so that lower source contact resistance would be achieved.

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Regarding claim 7 and 10, it is noted that the thicknesses of the source region and the source contact region are well recognized parameters of importance subject to routine experimentation and optimization.

Regarding claims 9 and 10, Harada does not disclose that the device can further comprise a heavily doped body (17) and that the heavily doped body can extend substantially into the inner corner. However, Applicant's admitted prior art (Fig. 1) disclose a heavily doped body (30) extending into the inner corner formed by the source contact surface and one of the trench surface.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to incorporate the heavily doped body region of the admitted prior art into the trench transistor of Harada, so that the potential parasitic bipolar transistor effect would be more effectively suppressed.

#### ***Response to Arguments***

4. Applicant's arguments with respect to claims 1-10 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

5. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located

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in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Shouxiang Hu** whose telephone number is (703) 306-5729. The examiner can normally be reached on Tuesday through Friday from 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Tom Thomas**, can be reached on (703) 308-2772. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is (703) 308-0956.

Shouxiang Hu  
February 15, 2001

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER